

New Frontiers Program 2003 and Missions of Opportunity
Written Questions and Answers
Last Updated 1/23/04

1. Page 4 and Page 7 of the AO appear to contain conflicting statements. Page 4 states, "However, all proposals for a New Frontiers Mission investigation that do not propose orbiting and *in situ* measurements of atmosphere of Jupiter, or surface and atmosphere *in situ* measurements of Venus, or sample returns from the South Pole-Aitken Basin area of the Earth's Moon, or a sample return from a comet nucleus, and that do not address the scientific objectives for a mission to each object (or the class of objects as in the case of comet missions) as given below will be considered nonresponsive to this AO and will be returned without further review." Page 7 states, "However, any mission architecture that achieves the majority of the science objectives stated above for a cost within the New Frontiers cost cap will be considered responsive to this AO." Clarification is requested on whether or not NASA HQ requires *in situ* measurements of the Jovian atmosphere proposal to be considered responsive to the New Frontiers AO. (An *in situ* measurement requirement would essentially identify a specific implementation, i.e., Jupiter probe(s) to obtain *in situ* measurements of the atmosphere, in order to be responsive to the New Frontiers AO.)

Answer: The language in Section 2.1.1 will not be used to return proposed investigations without further review where the proposed mission does not contain a probe, provided that the proposal claims to achieve the majority of the objectives contained in Section 2.1.4.

2. Page 4 of the AO states, "MO proposals may be for any objective within the purview of the OSS SSE program (see *The Space Science Enterprise Strategic Plan*, referenced in the NFPL), except Mars. However, all proposals for a New Frontiers Mission investigation that do not propose orbiting and *in situ* measurements of atmosphere of Jupiter, or surface and atmosphere *in situ* measurements of Venus, or sample returns from the South Pole-Aitken Basin area of the Earth's Moon, or a sample return from a comet nucleus, and that do not address the scientific objectives for a mission to each object (or the class of objects as in the case of comet missions) as given below will be considered nonresponsive to this AO and will be returned without further review." Does this paragraph mean, for the Moon, that any NON-SAMPLE return experiment or flight instrument would be "nonresponsive"? For example, proposing to fly an orbiting imaging experiment on a foreign space mission, would that be "nonresponsive"?

Answer: An MO which proposes to do lunar Science is not excluded by the language describing the acceptable missions for full New Frontiers Missions.

3. Appendix B, Section D.2.d (page B-6) states, "(Note: signed resumes of team members must be included as attachments to the proposal; see Section J below)." The requirement for signatures on the resume is inconsistent with Section 6.3.2 in

the AO (Page 36), which states, “These signatures are to be included at the bottom of the resumes required for each of these individuals and/or included on commitment letters from their institutions (see Appendix B, Section J.2 and J.3).” Can signatures be included on commitment letters from their institutions only or must they be on the resume as well? Please clarify which of these statements is correct.

Answer: Appendix B will be modified to be consistent with section 6.3.2 of the AO.

4. Section G of Appendix B (Page B-8) states: “It is recognized that teaming arrangements to implement the investigation may not be complete at the time of the proposal. Proposers will not be penalized for this if it is demonstrated that there are candidate implementation approaches for the spacecraft, launch vehicle, communications, and ground systems that will allow the successful implementation of the investigation within the proposed cost and schedule.”

This paragraph was originally in Section 7.2.4 of the draft AO but was deleted in the final version of the AO, the implication being that proposals without defined teaming arrangements will be penalized. Is this interpretation correct? Should this text be deleted from Appendix B?

Answer: Appendix B will be modified to be consistent with the body of the AO.

5. The AO states that New Frontiers missions should be launched no later than June 30, 2010. Will NASA accept proposals with launch dates after this date, assuming that a slightly later launch will reduce the overall cost to NASA OSS compared to an earlier launch date? If so, please give an indication of how much later than June 30, 2010 is allowable, i.e., 3 months later? 6 months later? etc.

Answer: No. The launch no later than date is firm.

6. Will proposals with a launch date before June 30, 2010, but with a launch period extending beyond this date be deemed to be compliant with the AO?

Answer: No. The launch no later than date is firm.

7. Section 7.2.4 of the AO states technologies with a TRL less than 7 (i.e., < TRL 7) will be penalized, whereas Section G.8 in Appendix B (Page 12-13) asks us to describe plans for bringing new technologies to a minimum of TRL 6 (i.e., = TRL 6) by the Confirmation Review at the end of Phase B. The former description makes no mention of a technology cutoff date. Should we assume the cutoff date is the Confirmation Review at the end of Phase B, as in the latter description?

Answer: Technologies should be TRL 6 by Confirmation Review and TRL 7 by launch.

8. Please clarify how the 5 additional pages for advanced technologies should be used. Can they be distributed throughout the Mission Implementation and Advanced Development section (so as to improve the flow of the proposal), or must they be lumped together in a separate section?

Answer: This is an additional 5-page allotment, identified and used only for that subject.

9. Appendix B, Section G, Item 7: Please define “aperture mass”.

Answer: Aperture mass refers to the mass of any optics present in the instrument design.

10. Are there margins included in the power curves for the MMRTG and SRG on Page 3 of the RPS document located in the New Frontiers Program Library?

Answer: No. The power curves were derived to most effectively use the thermal energy provided from a designated number of GPHS blocks. For the MMRTG, this was 8, while it was 2 for the SRG.

All margins for the RPS devices are being carried in mass. Note that the target masses for both MMRTG and SRG are less than the values in Table 1 (Page 3); however, the upper bound to ensure adequate conservatism in spacecraft system assessments.

11. Is there any overlap in the spacecraft accommodation and launch vehicle accommodation costs listed in the RPS and ELV program library documents? (Section 5.4 and Table 5.1 in the RPS document, and the Nuclear Launch Approval section of the ELV document).

Answer: No. The RPS accommodation values in the ELV document account for only the KSC charge for preparation of data books and ELV accommodation. All of the values in the RPS document account for other charges. The values from both documents should be used when estimating the total cost of provisioning RPS.

12. Section 5.9.1 of the AO states that the Participating Scientist Program (PSP) is not included in the cap, but must be included in the total NASA OSS Cost as stated in Section 5.2, but nowhere in Section 5.2 does it say that a PSP is excluded from the cap. Can we verify for sure that the PSP won't count against the cap?

Answer: PSP's and Data Analysis Programs (DAP's) will be included in the cap. Section 5.9.1, *NASA OSS Cost and Total Mission Cost*, will be modified to reflect that. However, NASA intends to establish a New Frontiers Data Analysis Program (NFDAP), separate from New Frontiers missions, but accessible to all New

Frontiers missions. This implementation will be identical to the Discovery Data Analysis Program already implemented for the Discovery missions.

13. On page B-2 smaller font is allowed for cost tables, what about other tables?

Answer: The direction in Appendix B at the top of Page B-2 beginning with “Figure captions should be in 12-point font, though smaller font is allowed within figures and cost tables (however, all figure information must be easily readable without optical aid).” stands as stated.

14. On Page B-2, it is stated that “One extra page is allotted for description of any optional Participating Scientist Program (PSP), and Data Analysis Program (DAP).” However, in the table immediately below the statement, in Section E it states that the page limit is 2. What is the correct page limit? Is there a separate page limit to each of the PSP and DAP?

Answer: The total page limit is 2 which includes both PSP and DAP.

15. On Page B-1, it states “Seventy CD-ROMs containing a single, searchable PDF file of the proposal must be delivered with 70 printed copies (see Section 6.3.3 of this AO).” Please define the extent and meaning of “searchable” PDF.

Answer: This means a single file searchable version.

16. Section 5.12.1 states "As noted in Section 1.2, NASA may select an MO investigation for immediate implementation (that is, without need for a Concept Study) provided that NASA is satisfied with its readiness for development and implementation as proposed. For such a selection, an MO proposal must (1) conform to these New Frontiers AO guidelines for an MO investigation, and (2) contain a commitment by the PI for the cost, schedule, and scientific and technical performance of the investigation with detail equivalent to that expected at the end of a Concept Study." How does one provide that level of detail without submitting a Concept Study Report? Please provide a more precise definition of the required detail?

Answer: MO proposals must adhere to the page count limits as stated in the AO. If an instrument concept is sufficiently mature and this can be demonstrated within the page count limits, then the Proposer can recommend skipping Phase A and proceeding directly to Phase B. However, it is NASA’s prerogative to determine whether the maturity of the investigation is sufficient to warrant skipping Phase A and proceeding directly to Phase B.

17. Section 1.1 states "New Frontiers Mission of Opportunity (MO) investigations are part of non-OSS space missions of any size that will be launched no later than Dec 31, 2008...." Later it states on Page 2 that “The MO category can also include

proposals for Extended Missions for approved NASA SSE missions in phase E and nearing the end of their Prime Mission or already in an approved extended phase." Does that mean that the mission has to be in phase E already when the proposal is submitted?

Answer: The MO opportunity includes both the opportunity to propose instruments or science investigations on non-OSS payloads, and the opportunity to propose extended planetary missions for SSE payloads that are already in Phase E or to propose planetary missions for non-SSE OSS missions nearing the end of their main missions. However, any mission extension must be to a mission already in Phase E (thus the mission must have already been launched).

18. In Section 7.2.3, Technical Merit and Feasibility of the Proposed Investigation, it states "MO investigations that do not include hardware (e.g., data purchase or data exchange for services as a Co-I) will be evaluated against all the factors above except that the non-NASA provided flight instrument design(s) will not be evaluated for its (their) ability to provide the necessary data. However, such proposals will be evaluated for the evidence that such data will be made available by way of signed commitments for their delivery in a format and timeframe suitable for the completion of the proposed investigation. It is assumed that NASA will not pay for these data unless the data, as delivered, are suitable for successful completion of the proposed investigation. In addition, data-buy MO investigations need not specify a performance floor, nor provide for a PSP and/or DAP (as defined in Section 5.2.5)."

Does this last sentence just apply to data-buy investigations or to all MO investigations that do not include hardware, i.e. should it say the following: In addition, MO investigations that do not include hardware (e.g., data purchase or data exchange for services as a Co-I) need not specify a performance floor, nor provide for a PSP and/or DAP (as defined in Section 5.2.5)?

Answer: MO investigations that do not include hardware need not specify a performance floor, nor provide for a PSP and/or DAP.

19. A supplier in Canada is the recognized leader for a particularly highly specialized technology required by a proposing team. The team wrote to ask if it were permissible to fund the Canadian supplier through a direct subcontract; however, there are no plans to have them as a Co-Investigator at this time. They wondered if NASA has any issue with this approach.

Answer: As you described it, no. You may contract for "goods and services" from Canada, and indeed most other countries. The "no exchange of funds" terminology applies to the support of non-US scientists.

20. This question is regarding the Letters of Endorsement in Appendix B. I have discovered that some of these letters have been addressed to the PI and some have been addressed to NASA, Office of Space Science. Which version is correct?

Answer: Letters of Endorsement should be addressed to the PI.

21. Please tell me where I can find list of potential primes for this new project.

Answer: There is no such list.

22. What is the impact of high declination (DLA) target requirements (up to $\pm 60^\circ$) on performance for escape missions on Delta IV and Atlas V?

Answer: The Atlas V and Delta IV evolved vehicle systems are early in their initial flight development and have not flown the sort of mission profiles necessary to support DLA values outside the typical $\pm 28.5^\circ$ band available using approximately due east trajectories out of CCAFS. Since performance will be significantly affected by range restrictions, it is not possible at this time to definitively quantify the performance loss associated with high DLA values. However, the impact can be assessed in an approximate manner. The adjustments that follow are intended to be used as rough guidelines, and could change upon the completion of detailed range safety analyses.

Orbital mechanics dictates that for any escape mission, the park orbit inclination must be equal to or greater than the absolute value of the DLA target. Three basic trajectory design approaches can be used to reach the high park orbit inclinations needed here.

Northeast trajectory (flight azimuth less than 90°) from CCAFS.

This approach involves flying along the east coast of the United States and Canada. The drawback to this approach is that the launch vehicle impact point trace passes over Europe and potentially the Middle East resulting in an elevated risk of human casualty. While this approach offers the best performance, there is a significant risk that the range approval process could produce considerable changes to performance; in the extreme, this approach could be completely invalidated.

Southeast trajectory (flight azimuth greater than 90°) from CCAFS.

Range constraints for this approach are better understood. However, limits on over-flight for Caribbean islands and South America limit launch azimuths to no more than 105° - 110° . This means that performance-costly dogleg maneuvers must be used to reach DLA targets above approximately 35° . The result is that this approach presents much lower range risk, but also much lower performance. This approach represents a lower bound on high DLA performance.

West coast launch from VAFB.

Since west coast launches already fly into high inclination park orbits, high DLA targets can be met by default. However, there is a certain amount of performance “overhead” involved with west coast launches. To estimate the performance impact of high DLA orbits, the following correction multipliers can be applied to the standard vehicle “due east” performance for a given C3 target.

Vehicle Performance Multipliers for High DLA Targets

Trajectory Option	Declination		
	40°	50°	60°
CCAFS Northeast	0.95	0.90	0.65
CCAFS Southeast	0.90	0.60	0.25
VAFB	0.80	0.80	0.80

Again, note that these adjustment factors are approximate. Missions using these factors to estimate high DLA performance should maintain ample performance margin and/or identify backup launch options in the event that actual performance is lower than these factors indicate.

23. In the AO, what exactly is meant by showing Dual Compatibility (e.g. Performance, Cost, PAF Interfaces, Volume)?

Answer: ~~Dual compatibility means that a payload is designed to be compatible with BOTH vehicle families through at least the competitive selection of the launch vehicle, subsequent to mission selection. Although both vendors have offered launch capacity in the intermediate and heavy performance categories, there is a gap in the Atlas V intermediate capability, which can only be met by the Delta IV heavy configuration. Proposers who seek to optimize one vehicle over another to minimize estimated proposal costs will still need to be compatible with the comparable configuration of the other launch system. NASA can make no commitment as part of this AO that a single solution will be selected for any mission.~~

~~The Proposer must show a mission design that is compatible with both families of vehicles characterized by the following parameters:~~

- ~~• Performance—Mission design must be able to be met by both families of vehicles (Delta and Atlas) with respect to vehicle performance.~~
- ~~• Cost—Launch service costs are identified in the AO.~~
- ~~• PAF Interfaces—Mission design must be able to be met by both families of vehicles (Delta and Atlas) in term of PAF interfaces~~
- ~~• Volume—Mission design must be able to be met by both families of vehicles (Delta and Atlas) with respect to Payload Fairing dimensions and volume.~~

Answer (12/5/03 Revision): Dual compatibility means that a payload is designed to be compatible with BOTH vehicle families through at least the competitive selection of the launch vehicle, subsequent to mission selection. Although both vendors have offered launch capacity in the intermediate and heavy performance categories, there is a gap in the Atlas V intermediate capability, which can only be met by the Delta IV heavy configuration. Proposers should seek to be dual compatible with both vehicle families. However, if a proposal team can identify compelling reason(s) not to maintain dual LV compatibility, then the proposal team may choose a single LV, for proposal purposes. NASA cannot assure that both launch service capabilities will continue to be available to support launches in 2010 and beyond, hence proposal teams who elect not to maintain dual LV compatibility in their proposed investigation must realize that in the event that their investigation is selected to enter Phase A, the dual compatibility requirement may be re-imposed. . Final assignment of a specific launch vehicle will occur after NASA conducts a launch service competition which will take place during Phase B. During Phase A and after the selection to proceed to the following phases, the Phase A cost cap growth rule (reference New Frontiers Program 2003 AO, Section 5.9.1) will not be applied solely to the re-imposition of the dual compatibility requirement

Mission designs that are dual compatible with both families of vehicles include the following characteristics:

- Performance – Mission design showing that both families of vehicles (Delta and Atlas) performance meet mission requirements (identify vehicle configurations).
- Cost – Launch service costs are identified in the AO.
- PAF Interfaces - Mission design showing that both families of vehicles (Delta and Atlas) PAF interfaces meet mission requirements.
- Volume - Mission design showing that both families of vehicles (Delta and Atlas) meet mission requirements with respect to Payload Fairing dimensions and volume.

24. What are the launch vehicle performance and costs associated with launching from the Western Test Range?

Answer: There is currently no Atlas V capability from the Western Test Range, only Delta IV capability. For the purposes of this AO, the Proposer should use the same prices, provided in the AO, for both the Eastern Test Range and Western Test Range.

See answer to question number 1 above for performance information. For specific performance information, contact Kennedy Space Center POC.

25. What are the LV costs for the New Frontiers Program for a 2010 Launch?

Answer: The KSC standard annual inflation factor is 3.5% for planning purposes.

26. The AO states that the Science Team will receive up to 25% of the returned sample (unless additional justification is provided). The AO also states that up to 30% of the sample may be provided to foreign investigators. If a proposal has foreign co-investigators as part of the Science Team, does the samples provided to them count as part of the 25% for the Science Team, or the 30% for foreign investigators, or both?”

Answer: The Science Team will be allocated no more than one-quarter by mass of the returned sample unless a larger fraction has been fully justified by the proposed investigation.” (AO section 5.5.2)

This allocation shall be made during a defined Preliminary Examination period immediately following mission return, in order to support the Science Team’s initial research effort. Any such allocation shall be negotiated with, and approved by, the NASA Astromaterials Curator.

Section 5.5.2 of the New Frontiers AO states, “As a proportionate return for investment by foreign participants in a mission that returns extraterrestrial materials, a fraction of the total returned sample may be forwarded to the national curatorial facility of the contributing country within six months after return to the NASA Astromaterials Curatorial Facility. It is expected that the amount of sample so transferred will be approximately proportional to the non-U.S. contribution, but in no case will be more than one-third of the total sample.”

The total of the allocations to all foreign participants made as a “proportionate return for investment” shall equal one-third or less of the total sample. Any material allocated to foreign members of the Science Team during the Preliminary Examination period shall be included in this one-third limitation. Any such allocations shall be negotiated with, and approved by, the NASA Astromaterials Curator.

27. It is the opinion of at least one Proposer that, on the issue of dual compatibility, the discussions and answers at the Preproposal Conference are different than that written in the New Frontiers AO. Clarification on dual compatibility (both cost and technical compatibility) is requested.

Answer: The New Frontiers AO Launch Services Information Summary has been revised effective 12/4/03, and now contains the following paragraph as paragraph 3:

There are two service providers in the intermediate and heavy performance classes of launch services (the Delta series provided by the Boeing Company and the Atlas family of launch vehicles provided by Lockheed Martin). Proposers should seek to be dual compatible with both vehicle families. However, if a proposal team can identify compelling reason(s) not to maintain dual LV compatibility, then the proposal team may choose a single LV for proposal purposes. NASA cannot assure that both launch service capabilities will continue to be available to support

launches in 2010 and beyond, hence proposal teams who elect not to maintain dual LV compatibility in their proposed investigation must realize that in the event that their investigation is selected to enter Phase A, the dual compatibility requirement may be re-imposed. Final assignment of a specific launch vehicle will occur after NASA conducts a launch service competition during Phase B. During Phase A and after the selection to proceed to the following phases, the Phase A cost cap growth rule (reference New Frontiers Program 2003 AO, Section 5.9.1) will not be applied solely to the re-imposition of the dual compatibility requirement.

28. Can the required DSN costing information, per the document *NASA's Mission Operations and Communications Services*, be included in Section I of the proposals where cost and cost estimating methodology are addressed?

Answer: Yes

29. Question: An organization wishes to propose to return samples from the South-Pole-Aitken Basin. They wish to know if it is strictly necessary to include any data analysis at all, or would it be considered non-responsive simply to deliver the samples and data to JSC?

Answer: NASA is soliciting Scientific Investigations through AO 03-OSS-03, and the opportunity called out is addressed in Section 2.1.3 entitled, *Lunar South Pole-Aitken Basin Sample Return*. The objectives for this mission are not simply to return samples from the South Pole-Aitken Basin, but also to satisfy the majority of the scientific objectives stated there. In particular, Section, 5.2.5 entitled, *Data Analysis Activities*, states the following:

“Investigation teams must also include an adequately funded data analysis period, independent of PDS archiving activities as part of their proposed Phase E activities. Data analysis should be understood to include publication of scientific results of the investigation in peer-reviewed journals.”

A proposed investigation that simply returns some quantity of sample material to NASA Johnson Space Center without addressing the majority of the science objectives as stated in Section 2.1.3 would not be responsive to the AO.

30. Question: A proposal team has identified an extremely favorable launch opportunity for their proposed mission, which falls a few months beyond the June 30, 2010 “launch by” date. This particular launch opportunity could would reduce flight time and improve performance to the extent that the latter launch opportunity would materially reduce cost. Given this situation, is there any flexibility in extending “launch by” date?

Answer: The “launch by” date must be maintained for the primary proposal. However, a launch opportunity after June 30, 2010 which is so favorable that the

net cost of the mission through Phase E would be reduced with the same or improved science return could be carried as a de-scope option.

31. Can a team proposing an MO for the Venus Express mission assume that NASA and ESA will have the same arrangement for Venus Express as they have with Mars Express, such that NAIF services will be provided at no cost at the spacecraft level?

Answer: At this time there is no arrangement between ESA and NASA for NASA to provide NAIF services or any other services for Venus Express. In any event, under full cost accounting, there is no separate source of funds for NAIF services, and all costs for NAIF services and/or DSMS support must be included by each proposing team as appropriate within the MO cost cap (reference New Frontiers Program 2003 AO, Section 5.12).

32. Proposals to the New Frontiers program will be large documents. It is possible that simply stapling the pages of each copy may not hold in all cases and some pages may be lost. Are there any alternative means of binding these important documents, particularly the original which is single sided, to ensure that no pages are lost?

Answer: This question refers to the AO Appendix B, Page B-1, which states:

“In order to allow for the recycling of proposals after the review process, all proposals and copies must be submitted on plain white paper only (*i.e.*, no cardboard stock or plastic covers, no colored paper, etc.). Photographs and color figures are permitted only if printed on recyclable white paper. The original, signed copy of the proposal (including signed endorsements) must be bound in a manner that makes it easy to disassemble for reproduction should NASA need additional copies. Except for the original, two-sided copies are preferred.”

Binding of proposals with staples is still the preferred method if this is possible. However, given the size and scope of proposals submitted to this AO, it is possible that some proposals will be too large to make stapling practical. In such cases, **the preferred option for binding is spiral binding** (Note however that no cardboard or plastic covers should be used, as indicated in the AO excerpt above).

Additionally, the use of 3-ring binders is strongly discouraged, as the increased space required for storage, increased costs for shipping to reviewers, and the relative ease with which pages of the proposal could be lost/out of place make binders an unattractive and inefficient option for proposal binding.